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Casein 57 Whey 54
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the whey is carbonated.

Date of Application, 22nd Jan., 1889—Accepted, 31st Aug., 1889

COMPLETE SPECIFICATION.

Improvements in and relating to the Manufacture of Milk-powder and Effervescent Beverages.

I, WILHELM GERBEL of Villa Marienthal, Rorschach, Switzerland, Landed Proprietor, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

This invention relates to the manufacture of milk-powder from skimmed or unskimmed milk and to the production of a wholesome and agreeable effervescent beverage.

The milk powder obtained is especially adapted for the preparation of bread, meal and other food, the said powder being mixed up to one half or three-quarters with meal or flour such as wheat, rice, or Indian flour. This product contains three times as much nutriment as that of meal or flour.

The process of preparing the said powder as compared with the artificial processes heretofore practised of preparing known products from milk, such as condensed milk, milk-powder, and the like, is very simple, and natural; it must however be very strictly carried out, in order to retain the nutriment and the unchangeable properties of the powder, as well as its flavour.

The improved process agrees with that of nature whereby the grains are dried in the alternate heating and cooling, without injuring the germinating property of the same.

This process therefore differs in many respects from those which have heretofore been employed, and yields excellent results. The condition into which the germ is brought affords an explanation for the fact that the milk-powder does not so readily commence to ferment. From this, results the advantage that the preservation is very simple, as by reason of the said circumstance the hermetic closing is superfluous.

Another advantage consists in the fact that with the use of the said powder the nutriment contained in the food prepared can be regulated by mixing the powder more or less with meal or flour.

The manufacture of the powder from entire or unskimmed milk is effected in the following manner that is to say ;—

The milk is first heated in boilers by steam or a wood fire to from 100 to 105 degrees Fahrenheit. Then the solid ingredients of the milk are separated as curd by adding rennet. The liquid ingredients, the whey, are separated from the curd by pressing or by centrifugal action. In working on a small scale the curd is reduced with a mincing knife but in working on a large scale a breaking-mill as customary in the manufacture of cheese is employed. The slices or chips are then spread upon sheet-metal hearths and dried when working on a small scale, in a baking oven, or when manufacturing on a large scale upon a fruit dryer, or the like. They are exposed to a temperature of from 110 to 120 degrees Fahrenheit for a period of six hours, during which it is frequently turned over with a shovel. After this operation the casein is allowed to cool for from six to nine hours, and is then heated again for the same length of time to the same temperature.

These operations are repeated until all the water has been removed from the casein, because the latter can be ground only in a perfectly dry state, which is the case after heating the same three times.

If however, this meal is to be preserved for a long time, the substance must be heated four or five times. The dried substance can be ground to powder through the medium of a fruit mill or other crushing mill, and is then ready for use.

The manufacture of the milk powder from skimmed milk is effected in a manner similar to that above described that is to say :—

After the butter has been obtained by means of centrifugal apparatus, the skimmed

milk is passed into a copper boiler, and is slowly heated to from 95 to 104° F. by means of fire or indirectly by steam. For the separation of the casien (curd) the necessary quantity of rennet or else tartaric acid is then added while stirring.. The stirring is continued until the casien of the milk has been separated by coagulation from the watery parts of the milk (whey) this being effected the coagulated matter is freed from the whey through the medium of cloth filters and presses on a centrifugal apparatus as far as this can be effected by pressing. The casien is afterwards finally divided by means of mincing knives when working on a small scale, or by means of a mincing machine when working on a large scale, it is then spread upon sheet-metal hearths and put in a drying-oven. Any drying oven (fruit dryer) or baking oven can be employed for this purpose. In this oven the matter is subjected to a temperature of from 110 to 120° F. for a period of six hours, it being frequently turned over, it is next allowed to cool for from 6 to 9 hours and is then heated to the same temperature and cooled a second and third time. The matter will then be so dry that it can be ground to powder by means of a hand or a flower mill. If however the powder is to be preserved for a long time the material must be heated a fourth and fifth time as above described. By reason of the simplicity of this process the milk can be utilized even in the smallest dairy without necessitating the use of expensive apparatus. This further mode of utilizing milk is a means for decreasing the production of poor cheese, increasing the use of milk, and thereby increasing the value of the same.

A chemical analysis made at the Chemical Laboratory of Dr. Steiger in Zurich showed the following results as regards the milk powder.

Moisture	10,23 %
Fat	0,93 „
Mineral substances	6,51 „
Protein substances (albumen)	70,25 „
Extractive matter (including raw fibre) not containing nitrogen	12,08 „
	100,—%
Digestible substances	98,73 %

DRY SUBSTANCE.

Fat	1,02 %
Mineral substances	7,17 „
Protein substances	77,43 „
Extractive matter (including raw fibre) not containing nitrogen	14,38 „
	100,—%
Digestable substances	98,58 %

This powder, without being packed hermetically can be preserved just as long as any fruit-powder which is not the case with the milk preserves made according to the processes heretofore known. From this powder if mixed to $\frac{1}{3}$, $\frac{2}{3}$ or $\frac{1}{2}$ with rye wheat or any other meal, a savoury bread can be prepared. It can also be made into meal food, and into the finest pastry. As the alimentary value of the powder is equal to that of meat, a biscuit made of the same is of great value for the victualling of the army and navy.

The whey obtained in the separation of the casein is free from the whey-cheese by heating and by adding whey-vinegar or tartaric acid, the said whey-cheese being mixed in the described manner with the casein to be treated. To add tartaric acid is more advantageous, because the flavour of the beverage thereby becomes more agreeable. The whey is then filtered through a fine cloth, and the necessary sugar, such as grape-sugar, cane-sugar, or milk-sugar is added from which so much

carbonic acid is then generated as is contained in any beer of an agreeable flavour It is then put into suitable beer bottles; after these bottles have been properly closed, they are put in a place where a temperature of from 60 to 70 degrees Fahrenheit prevails, and in from 8 to 12 days carbonic acid has been generated to a sufficient extent.

The whey is in this manner converted into a beverage which compares favourably with any ordinary beer, as this product is very wholesome, and invigorating and owing to its cheapness can be consumed by all classes of people.

Instead of producing the carbonic acid by fermentation, the beverage can be impregnated with carbonic acid that has been manufactured by artificial means, as in the manufacture of artificial mineral waters. This is advisable in case the formation of alcohol in the whey is to be obviated.

The beneficial effects of whey are well known; they are increased in the said improved process by the presence of natural carbonic acid which effectively promotes digestion.

By reason of its union with the carbonic acid the whey can be preserved for a long time and its complete decomposition into latic acid and acetic acid is prevented and the beverage is very wholesome.

In order to adapt the beverage for continual use so that it can be consumed by the farmer or workman at any time, the whey may be put into a cask, and sugar may be added to the same. After the cask has been properly closed the whey is subjected for from 8 to 15 days to a temperature of from 57 to 65 degrees Fahrenheit; the fermentation will then take place, and carbonic acid will be generated.

The beverage produced in this manner is more wholesome, refreshing and nutritious than ordinary beer.

By adding aromatic juice of fruit to the beverage produced according to the described process it can be rendered very palatable.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed I declare that what I claim is:—

First. The preparation of milk-powder either from unskimmed milk, or from milk which has been skimmed by means of centrifugal apparatus, without adding cane-sugar, milk-sugar or grape-sugar, the product being subjected to periodical drying at a low temperature without producing a vacuum, for the purpose of obtaining the entire amount of its nutriment, so that bread of an agreeable flavour, meal and other food can be prepared therefrom, the said powder being mixed up to two-thirds, one-half or to one-third with wheat, rice, Indian flour or other substance and the nutriment contained in the bread being then equal to that contained in meat, and the dough fermenting without yeast, substantially as hereinbefore described.

Second. The preparation of a beverage from whey, which beverage, by reason of the carbonic acid it contains, is equal to ordinary beer, as the carbonic acid is developed in a natural way, and which beverage can be rendered more agreeable to the taste by adding aromatic juice of fruit and sugar, substantially as hereinbefore described.

Dated this 22nd day of January 1889.

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